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ABSTRACT

This report focuses on students who are underrepresented in the high academic achievement pool by calling attention to the important role that relational data management systems can play in educational decision making, particularly with regard to how they can be applied to closing the academic achievement gap. After explaining the need for data collection and evaluation, the report examines elements of a data gathering system, then presents examples of data management systems, looking at programs and data support resources. The report concludes that the development of relational program and student data management systems provides schools with increased capacity to document and understand the characteristics of respective inputs and outcomes by categories of students, staff, and programs in relation to differing educational contexts and circumstances. Effective data management systems can make this capacity readily available in a "user friendly" format to people at various levels in decision making. Two sidebars offer data support resources and data disaggregation tools. (Contains 15 references.) (SM)

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TOWARD A RELATIONAL DATA MANAGEMENT SYSTEM FOR EDUCATION

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Pedagogical Inquiry and Praxis

INFORMING THE DEVELOPMENT OF HIGH ACADEMIC ABILITY IN MINORITY STUDENTS

THE PROGRAM OF RESEARCH ON AFFIRMATIVE DEVELOPMENT OF ACADEMIC ABILITY, TEACHERS COLLEGE, COLUMBIA UNIVERSITY AND THE COLLEGE BOARD

Number 4, February, 2003

Toward a Relational Data Management System for Education

The Need for Data Collection and Evaluation

Several ideas have been advanced recently concerning ways to close the academic achievement gap between many students of color and their European American and Asian American counterparts. For example, previous issues of this newsletter have advocated for: (1) the use of knowledge generated from the scientific community regarding how people learn (Bridglall, 2001); (2) attention to the deliberate development of academic ability, particularly for underachieving students of color and generally for all students who come from underresourced families and schools (Gordon, 2001); and (3) the use of supplementary education to promote high levels of academic and personal development (Bridglall & Gordon, 2002).

In this issue of *Pedagogical Inquiry and Praxis* we continue the focus on students who are underrepresented in the high academic achievement pool by calling attention to the important role that relational data management systems can play in education decision making, especially with regard to how they can be applied to closing the academic achievement gap. We refer to decisions concerning education policy, the conduct and management of teaching and learning, and the provision of continuing professional development. Our focus on these topics is not happenstance. Darling-Hammond (1998) has emphasized the critical relationship of the level and quality of teacher preparation and actual teaching practices to the academic development of students. Gordon (1986), Greeno (2001), and Resnick (1999) have examined the explicit value of learner behaviors—such as time-on-task, deployment of relevant effort, and resource utilization—to the quality of students' academic achievement. Still other researchers suggest that governance, leadership, and organizational structure of classrooms and schools are the more significant determinants of educational effectiveness. We can agree that these differing perspectives may vary in their actual influence on what occurs in school. What continues to frustrate researchers and practitioners, however, is the question of why certain groups of children do not perform well despite school interventions designed specifically to close the academic achievement gap.

The problem in identifying specific factors and patterns that influence achievement may be related to the fact that the interactions of the variables grounded in these several perspectives affect not only the impact of each, but also the way that the variables interact from one situation to the other. It is thus important that those responsible for teaching and learning activities not only understand these dynamic interactions but also use that understanding to inform decisions regarding policy and practice to improve pedagogy and learning.

Particular kinds of decision making must be informed by relevant information on students, staff, program, and the deployment of resources. Fortunately, new computer technology increases educators' capacities to use data systematically to manipulate the interactions inherent in teaching and learning situations. Data systems currently exist in most education institutions, and especially in public education systems, but the knowledge to use data to improve teaching and learning on macro levels (i.e., district, program, and school), and on micro levels (including classrooms and individual learner situations), is lacking. Thus, we need to identify the variables that influence teaching and learning and develop efficient measurement and data gathering systems that incorporate them. In addition, we need to invest in capacity building—training administrators, supervisors, and teachers—so that personnel can use the data to inform daily decisions.

Elements of a Data Gathering System

According to the Center for Research on Evaluation Standards and Student Testing (CRESST), there are three building blocks of accountability (in addition to several key capacities) that support the development and implementation of a comprehensive and effective accountability and data management system: (1) a set of policies and procedures that encourages and supports effective teaching and learning; (2) differential strategies for regularly eliciting and managing information that not only indicate how schools are functioning for all students but also identify specific areas of the school context that may influence the school's success or failure; and (3) mechanisms for reconsidering school practices when students are not well served.

Information appropriately managed through technology enables the tailoring of data analysis and management in ways implicit in pedagogical approaches which were first proposed as early as the mid twentieth century. Tyler (1949) advocated the use of data from tests and other assessments for data-based decision making in the classroom for instructional purposes. Flanagan (1967) suggested that one of the ways to address the special and individual needs of students, and of specific groups of learners, is to customize the pedagogy. Moreover, Flanagan and Glaser (1967), independently working on related models, asserted that individualized and customized teaching and learning would rest on the teacher's capacity to manage large amounts of student and instructional data and materials as the basis for decisions concerning the design and management of teaching and learning transactions. These ideas were never fully implemented, partially because educators did not have the capacity to manage the information necessary to design, deliver, and evalu-

ate individualized instruction.

We are at a juncture where we recognize that it is not only in the design and management of teaching and learning transactions that precise information is needed. Indeed, administrators and policy-makers need to make decisions that require their understanding of education data and information on the functioning of the various personnel, students, programs and systems for which they are responsible. Yet only few school districts have the capacity to manage these data efficiently and in ways that can inform critical decisions and, equally important, anticipate both intended and unintended consequences. Existing databases in school, district, and state systems are generally uncoordinated, redundant, and/or have large gaps in essential information. Current systems of data management are built in response to top-down, politically driven, often legislative actions, with little cognizance of the relational information needs of the people who make day-to-day education policy and practice decisions. Guidance counselors, instructional supervisors, and teachers who could use these data are often overwhelmed by the tasks of searching out the relevant information to meet their decision-making needs.

The capacity to analyze program, staff, and student data to better inform education decisions now exists. In the U.S., we have the technology to document the dynamic interactions between multiple variables in diverse teaching and learning situations. We can quickly examine relationships among a wide range of dependent and independent variables to determine the interaction of demographic characteristics, learning behaviors, class size, instructional behavior, teacher characteristics, curriculum demands, time on task, attendance patterns, resource availability, and resource utilization, for example. Through the use of relational program and student data management systems, it is possible to identify program, staff, and student variables that are associated with particular pedagogical outcomes.

Broadly speaking, the information products of these data management systems are limited only by the character and quality of a school system's data inputs and the particular questions asked of the system. Given the imperative to uncouple achievement from such social divisions as class, ethnicity, gender, and first language (Coleman, 1965), and, more recently, the goals of the No Child Left Behind legislation, one of the critically important advantages of a data management system is its capacity to disaggregate data by specified input and outcome variables and to identify relationships between them. In addition, Lezotte and Jacoby (1992) suggest that a primary purpose of these analytic processes is to provide individual schools and districts with the mechanism for gauging their own effectiveness.

To that end, specific procedures can be used to identify the different subsets of students who master (or fail to master) the curriculum, by school, grade level, program, and/or course. An analysis of achievement by grade level, for example, can enable principals and district supervisors to monitor whether: (1) students of differing socioeconomic levels, races, and gender are mastering the essential student outcomes; and (2) whether the curriculum is equitably available, taught to and mastered by all students, especially those from disadvantaged and underrepresented groups. The disaggregation of data which the federal government proposes to use in monitoring and monetarily rewarding or punishing states whose schools do not demonstrate improvements on standardized tests (James, Jurich, & Estes, 2001) is also a practical, hands-on process that enables a school to answer two critical questions: For whom is its curriculum effective? and What does the curriculum teach?

Examples of Data Management Systems

Mary Ann Lachat played a pivotal role in initiating one of the more comprehensive relational data management systems we have reviewed. The SOCRATES™ system (developed by Lachat and the Center for Resource Management [CRM]) was designed to enable the management and disaggregation of data, to track the programs and practices to which students have been

Data Support Resources

Toolbelt, by the North Central Regional Educational Laboratory: Includes a wealth of resources to support data-driven decision making including: data retreat facilitation guide, data tools, planning tools, surveys, check lists, etc.
http://www.ncrel.org/toolbelt/

Data-Driven Implementation Tools: Includes three free tools for K-12 schools to use: School Climate Inventory (SCI), Student Achievement Data, and School Observation Measure.
http://www.serve.org/csrd/datadriven/data.html

Evaluating Whole-School Reform Efforts: A Guide for District and School Staff: Provides an overview of conducting impact and implementation evaluations.
http://www.nwrac.org/whole-school/index.html

Using Data to Improve Student Achievement: Offers several tools to analyze and interpret data that were designed to aid schools in analyzing Kentucky school data, but provide helpful examples for all school personnel.
http://www.kde.state.ky.us/oapd/rsc6/dataanalysis.asp

Disaggregation without Aggravation: Is a multimedia training package for sale from the Southwest Educational Development Laboratory that includes case studies of schools as well as training and facilitation materials.
http://www.sedl.org/pubs/catalog/items/teaching06.html

Using Data to Improve Schools:
http://www.aasa.org/cas/UsingDataToImproveSchools.pdf

American Association of School Administrators' Center for Accountability Solutions: http://www.aasa.org/cas/

Fundamental Assessment Principles for Teachers and School Administrators: Article.
http://ericae.net/pare/getvn.asp?v=7&n=8

Data Disaggregation Tools

Ease-e Data Analyzer by TetraData: Is an online tool for data warehousing, mining, analysis, and reporting. Data can be disaggregated and reported by gender, ethnicity, and socioeconomic status. Standards can be created, tracked and analyzed with graphs and reports generated. TetraData also offers a Data Manager tool to assist in the import and export of data from a variety of sources. http://www.ease-e.com/ease-e/products/products_services_analyzer.asp

Goalview: Offers teachers and administrators the ability to set goal, track performance, and report results especially for special needs and Title I students. Includes Goalcard, an individual report of student progress on standards that can be disseminated to teachers and parents; and a database of 250,000 Education Standards and 10,000 Special Education goals to assist in creating goals and IEPs. Provides instructional resources as well as access to Federal and state laws and regulations.
http://goalview.school.aol.com/GOALVIEW/index.asp

SchoolNet: Offers a number of web-based tools for data collection and analysis as well as aligning curriculum and instruction to standards. http://www.schoolnet.com

Socrates, by the Center for Resource Management: Offers tools and services to help schools import data, analyze, and ask good questions. Has a capacity of 2 billion pieces of information and allows unlimited import of any electronic data source into a relational data base that can disaggregate data for one-to-one, one-to-many, or many-to-many relationship analyses.
http://www.crminc.com/socrates/default.htm

Quality School Portfolio: Is a free data analysis system consisting of two tools: a Data Manager, which allows a school or district to import data, disaggregate the data, and report about the data; and a Resource Kit, which consists of 21 tools to collect data including survey instruments, observation protocols, and questionnaires. Tools can collect information in these areas: Safety & Security, Parent Involvement, Professional Development, Curriculum & Instruction, Technology & Innovation, and Special Programs. QSP can house 8,000 records with 120 variables for 7 years. Data analysis is limited to mean, median, count, percentage, and distributions. Displays are limited to pie charts, tables, bar graphs, cross tabulation, line chart, and histogram.
http://qsp.cse.ucla.edu/mainSub/whatSet.html

Source: Slowinski, 2002.

exposed, and to keep a cumulative record of the knowledge and skills students may or may not have acquired. According to CRM, the SOCRATES™ system has import and data merge capabilities that can be used to integrate data from school records, administrative files, and standardized assessments to answer a wide range of questions.

Obviously, other programs exist and are being developed. For example, Edmund W. Gordon was involved in the conceptualization of programs developed several years ago for the Prince Georges County Maryland Public Schools by the College Board's Equity 2000 initiative and the Montgomery County Maryland Public Schools. Their goal was to encourage teachers and principals to collect and interpret student, staff, and program data by providing access to desktop computers programmed to process such data. While the technical demands were modest, the program enabled immediate access to both aggregated and disaggregated student and program data. Personnel were thus able to monitor the dynamics of student placements, evaluate program effectiveness, gauge individual and collective student progress, and examine the relationships between these variables. The difficulties in these efforts were related to (1) gaining access to the relevant data to enter into the systems, (2) designing and managing the data entry process, and (3) developing the human capital necessary to support and utilize the systems.

An interesting effort to apply data-driven decision making was evaluated by Madhabi Chatterji of Teachers College, Columbia University. It involved using district level databases in a needs assessment for the Safe and Drugs Free Schools (SDFS) program in two Florida school districts for the purpose of initiating new programs. The effort was made in response to a state-sponsored competition for federal funds under the Goals 2000 initiative at a mid-size Florida school district. A review of the literature on student risk and resiliency factors by the School and Community Advisory Council enabled the identification of three categories of indicators that would define a "high need school" for the SDFS program. Three categories of data elements, extracted from the district's management information system and the Florida Information and Resource Network System, included: (1) academic risk indicators (student achievement data), (2) demographic risk indicators (SES, mobility, attendance); and (3) social-behavioral risk indicators (crime, violence, truancy, and substance abuse). Reports showing school level aggregates of individual data elements and their interrelationships were prepared for district level decision makers. Subsequently, stakeholders were led by the evaluator through a systematic set of steps to arrive at a ranked list of schools that had the highest needs profiles for SDFS funding.

While space constraints prevent an elaboration of all existing relational data management programs, the following programs/data support resources may be of interest:

- The Quality School Portfolio (developed by the Center for Research on Evaluation, Standards and Student Testing (CRESST) is a web-based mechanism for disaggregating tests and other data and examining data as mandated by state accountability systems and by the No Child Left Behind Legislation;
- EDexplore™, developed by Edsmart Inc., manages data processes from data extraction and transformation to loading and hosting the resulting database on its servers. Clients, who gain access via the internet, receive training and ongoing support on the use of data to inform decisions.
- ACCOUNT allows selected personnel access to relevant information concerning related and disparate aspects of schooling, including trends in attendance, test scores, finances, and student demographics. Similar to EDexplore™, ACCOUNT also integrates separate databases into a data warehouse.

Additional data disaggregation and management tools have been identified by Slowinski (2002) and are described in the box on page three. While these resources are clearly useful, it is important to address the criteria to which relational data management systems should adhere. CRESST suggests that data management systems should not only utilize various types of data from diverse sources, but should also include relevant information concerning program, student, and staff characteristics to (1) provide contexts for interpreting student achievement; (2) account for student outcomes such as achievement, attendance, mobility, and rates of retention in grade, dropout, and graduation; and (3) provide data not only on the available instructional resources and curriculum materials, but also on the degree to which students are provided with adequate opportunities to master content specified in state and other curriculum standards.

Conclusion

For years, policy-makers, researchers, and practitioners have depended on summary descriptions of aggregated data, or on rather primitive analyses of the relationships between static categories of these data as the basis for education related decisions. Too often we have had to resort to variably informed estimates as the basis for decision making—an approach to data management with serious limitations. The development of relational program and student data management systems provides schools increased capacity to document and understand the characteristics of respective inputs and outcomes by categories of students, staff, and programs in relation to differing educational contexts and circumstances. Effective data management systems can make this capacity readily available in "user friendly" formats to people at various levels in decision making. Clearly, solving the recalcitrant problem of reducing differences in the academic achievement of diverse learners can be facilitated by the capacity to use relevant data to inform educational decisions. This renders use of relational program and student data management systems an important component of an informed strategy for closing the academic achievement gap.

—Edmund W. Gordon and Beatrice L. Bridglall

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